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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,468	03/04/2002	Craig A. Willkens	55567	5103
21874	7590	08/16/2004	EXAMINER	
EDWARDS & ANGELL, LLP			JEFFERY, JOHN A	
P.O. BOX 55874			ART UNIT	
BOSTON, MA 02205			PAPER NUMBER	

3742

DATE MAILED: 08/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/090,468

**Applicant(s)**

WILLKENS, CRAIG A.

**Examiner**

John A. Jeffery

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11, 14-19 and 21-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, 14-19 and 21-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11, 14-19, and 21-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Axelson (US5705261) in view of Willkens et al (US5786565).

Axelson (US5705261) discloses a ceramic igniter comprising a conductive zone 16, "power booster zone" 14 of higher resistivity, and "hot zone" 12 of highest resistivity. See col. 4, lines 37-55. The "power booster zone" 14 comprises about 50-70 v/o nitride ceramic and about 30-50 v/o  $\text{MoSi}_2$  and SiC in a 1:1 volume ratio. See col. 4, lines 44-46. In view of this composition, the booster zone 14 would inherently have a PTCR. If this inherency is disputed, then Applicant is referred to Willkens et al (US5786565) where, in col. 4, lines 1-17, the hot zone of the igniter is described as having a PTCR which has a composition of (1) between 50-75 v/o of a nitride ceramic, (2) 10-45 v/o SiC, and (3) between 8.5-15 v/o  $\text{MoSi}_2$ . In view of the similarity of composition between the zone having a PTCR in Willkens et al (US5786565) with the "power booster zone" 14 of Axelson (US5705261), the PTCR characteristics would not only be inherent to the zone 14 of Axelson (US5705261), but also would have been obvious to

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one of ordinary skill in the art. Moreover, in view of their diverse resistivities, each zone would inherently differ in operational temperature during use.

The claims differ from the previously cited prior art in calling for the hot zone path length to be 2 cm or less. However, Willkens teaches forming the hot zone such that it is less than 0.5 cm. See abstract. By providing hot zones of relatively short length, isolated temperature gradients are avoided that can cause premature failure. In view of Willkens, it would have been obvious to one of ordinary skill in the art to provide a short hot zone length (i.e., 2 cm or less) for the hot zone in the igniter of Axelson so that isolated temperature gradients are avoided that could cause premature failure.

The claims also differ from Axelson in calling for a central heat sink zone. Providing a central heat sink disposed between the conductive, booster, and hot zones of an igniter is conventional and well known in the art as evidenced by Willkens noting heat sink 19 which ensures that the igniter has high resistance to convective cooling and a low inrush current. Willkens, col. 3, lines 20-29 and Fig. 2. In view of Willkens, it would have been obvious to one of ordinary skill in the art to dispose a heat sink between the conductive, booster, and hot zones of the previously described igniter in order to ensure that the igniter has high resistance to convective cooling and a low inrush current. Regarding claims 14 and 16, note col. 7, lines 56-58 of Willkens in which a temperature of 1100 - 1350 °C is reached in one second from a nominal 24V source.

Regarding claims 9-11, it is well settled that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or

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workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233,235 (CCPA 1955). Because the relative room and operating temperature resistivities of the conductor zone 16, booster zone 14, and hot zone 12 of Axelson meet the general conditions of the claims, the claimed relative ranges of (1) conductor-to-booster zone resistivity, and (2) booster-to-hot zone resistivity merely set forth the optimum ranges of such resistivity readily discoverable by routine experimentation by skilled artisans. Accordingly, the recited ranges are not patentable over the cited prior art. Similarly, although Axelson does not expressly state the length of booster zone 14, the claimed booster zone path length in claim 21 merely sets forth the optimum ranges of path length to achieve a desired resistivity; such optimum lengths to achieve a desired resistivity are readily discoverable by routine experimentation by skilled artisans. Accordingly, the recited path length ranges are not patentable over the cited prior art which discloses the general conditions of the claims.

With regard to sintering the ceramic, Axelson (US5705261) in col. 5, lines 45-49 discloses that the ceramic igniter was prepared "in accordance with the teachings of the Washburn patent [i.e., US5045237]" which discloses a sintering process.

### ***Response to Arguments***

Applicant's arguments filed 6/23/04 have been considered but are not deemed to be persuasive.

First, as noted earlier in prosecution, Axelson's preference for not including the booster zone does not preclude the teaching of providing a booster zone. Merely

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because a disclosed embodiment in a prior art reference is not preferred by the inventor does not foreclose its status as prior art for all that it teaches.

It is well settled that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). See also *Celeritas Technologies Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998). A cursory inspection of Fig. 1 of Axelson would immediately reveal the existence of a booster zone 14 to the skilled artisan. Although the booster zone is nonpreferred in some embodiments, it is nevertheless present as Fig. 1 clearly shows. Therefore, the three zones of Axelson -- including the booster zone -- are prior art and properly relied upon in the examiner's rejections.

Willkens is Properly Combinable With Axelson.

Initially, the examiner has considered Dr. Yu's declaration submitted under 37 CFR 1.132 ("Yu Declaration"). Dr. Yu's overall conclusion is that a longer electrical path length in a ceramic igniter results in a longer time to temperature (TTT) value. Yu Declaration, P. 2 and 5. Indeed, these results are consistent with the teachings of the Willkens reference discussed below.

Applicant notes that Axelson does not disclose hot zone path length and teaches fabricating the heater in accordance with the Washburn '237 patent with a path length "well in excess of 2 cm." Applicant's main argument is that there would be no

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motivation to combine the teachings of Willkens with Axelson because (1) Willkens has an interposed heat sink zone and Axelson does not, and (2) Willkens' hot zone directly adjoins cold, conductive zones. Remarks, P. 9.

But Willkens provides a strong suggestion that a shorter hot zone path length in a ceramic igniter reduces the igniter's TTT characteristics -- regardless of the presence of a heat sink or an intervening booster section. In col. 1, lines 37-49, Willkens discusses a prior art ceramic igniter with a hot zone length from 1.5 - 6 cm. Such igniters, however, exhibited TTT speeds of 3-5 seconds.

Therefore, according to Willkens, attempts were made to increase the TTT speed of ceramic igniters to below 3 seconds. Willkens, col. 1, lines 50-64. One technique was to reduce the mass of the hot zone by reducing its path length. Willkens, col. 1, lines 51-56. As Willkens notes, an igniter cited in a Washburn article from 1988 achieved TTT speeds as low as 1.5 seconds by reducing the path length to 1.0 - 1.3 cm. *Id.* Moreover, the patent discusses a 1994 article to Willkens that recommends forming an igniter with a path length of at least 1.8 cm. In fact, it was previously thought that the practical minimum limit of the hot zone was 0.5 cm. But Willkens was able to decrease the path length even below 0.5 cm to improve the igniter's TTT speed. Col. 3, lines 21-25.

In short, the inescapable conclusion the skilled artisan reaches from this discussion is that by decreasing the path length of the igniter's hot zone (i.e., reducing the hot zone's mass by shortening the hot zone), the igniter's TTT speed will increase. This teaching -- consistent with the test results and overall conclusions in the Yu

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Declaration -- is readily apparent to the skilled artisan irrespective of the presence of a heat sink. In fact, the heat sink of Willkens is provided to mitigate convective cooling of the hot zone and to provide additional mechanical support. Col. 5, lines 11-16. The mere presence of the heat sink does not negate the reference's fundamental teaching that reducing the hot zone path length increases the igniter's TTT speed. Thus, the teachings of Willkens are applicable to ceramic igniters generally, and the skilled artisan would be motivated to apply its teachings to the base reference to Axelson to increase the igniter's TTT speed.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John A. Jeffery whose telephone number is (703) 306-4601. The examiner can normally be reached on Monday - Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans, can be reached on (703) 305-5766. All faxes should be sent to the centralized fax number at (703) 872-9306.

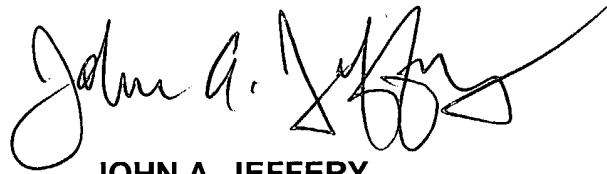
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A handwritten signature in black ink, appearing to read "John A. Jeffery", with a long, sweeping horizontal line extending to the right.

**JOHN A. JEFFERY  
PRIMARY EXAMINER**

**8/13/04**